CLAIMS

1. A combustion chamber assembly for use in a piston of a diesel engine, comprising:

a combustion chamber being defined intersecting a crown of the piston, the combustion chamber being defined by a concave surface and three convex surfaces, adjacent surfaces having direct smooth junctures.

2. The combustion chamber assembly of claim 1, a combustion chamber center portion being defined at least in part by the convex sphere to define a post, the sphere having a radius and an origin, the origin of the radius lying on a combustion chamber central axis;

a combustion chamber second curved surface forming substantially a bowl bottom margin and being a concave annular surface and having an origin and a radius and being joined to the post, the second curved surface providing a minor part of the combustion chamber reentrancy;

a combustion chamber third curved surface being a convex annular surface and forming a portion of a combustion chamber side margin and providing a major part of the combustion chamber reentrancy, the third curved surface having an origin and a radius and being joined to the second curved surface; and

a combustion chamber fourth curved surface defining convex annular bowl lip surface intersecting the crown of the piston and being joined to the third curved surface.

3. The combustion chamber assembly of claim 2 wherein the origin of the post is disposed on the center axis of the combustion chamber, the center axis of the combustion chamber being coaxial with the center axis of the piston.

4. The combustion chamber assembly of claim 1 wherein a juncture between adjacent curved surfaces requires no additional surfaces to effect a smooth transition therebetween.

5. The combustion chamber assembly of claim 1 wherein the combustion chamber is symmetrical about a combustion chamber center axis.

6. The combustion chamber assembly of claim 2 wherein the ratio of a radius of a center portion convex spherical surface, RS1, of the combustion chamber to a maximum bowl diameter, D2, is greater than 0.11 and less than 0.48.

7. The combustion chamber assembly of claim 6 wherein the ratio of the radius of the center portion convex spherical surface, RS1, of the combustion chamber to the maximum bowl diameter, D2, is substantially 0.314.

8. The combustion chamber assembly of claim 2 wherein the ratio of a combustion chamber bowl diameter D2 to a piston diameter D1 is greater than 0.46 and less than 0.86.

9. The combustion chamber assembly of claim 8 wherein the ratio of the combustion chamber bowl diameter D2 to the piston diameter D1 is preferably substantially 0.598.

10. The combustion chamber assembly of claim 2 wherein the ratio of a diameter of the bowl lip D3 to a maximum bowl diameter D2 is greater than 0.44 and less than 0.999.

11. The combustion chamber assembly of claim 10 wherein the ratio of the diameter of the bowl lip D3 to the piston diameter D2 is substantially 0.88.

12. The combustion chamber assembly of claim 2 wherein the ratio of a concave annular surface R1 to a maximum diameter of the bowl D2 is between 0.06 and 0.36.

13. The combustion chamber assembly of claim 12 wherein the ratio of the annular surface R1 to the maximum diameter of the bowl D2 is substantially 0.12.

14. The combustion chamber assembly of claim 2 wherein the ratio of a convex annular surface R2 to a maximum diameter of the bowl D2 is between 0.06 and 0.41.

15. The combustion chamber assembly of claim 14 wherein the ratio of the annular surface R2 to the maximum diameter of the bowl D2 is substantially 0.141.

16. The combustion chamber assembly of claim 2 wherein the ratio of a maximum bowl depth H1 to a maximum bowl diameter D2 is between 0.24 and 0.54.

17. The combustion chamber assembly of claim 16 wherein the ratio of the maximum bowl depth H1 to the maximum bowl diameter D2 is preferably substantially 0.308.

18. The combustion chamber assembly of claim 2 wherein a ratio of a height of the bowl post H2 to a maximum bowl diameter D2 is between 0.13 and 0.43.

19. The combustion chamber assembly of claim 18 wherein the ratio of the bowl post height H2 to the maximum bowl diameter D2 is preferably substantially 0.226.

20. The combustion chamber assembly of claim 1 the combustion chamber having a central axis, the combustion chamber central axis being coincident with a piston central axis.

21. The combustion chamber assembly of claim 1 being formed free of flat surfaces.

22. A piston of a diesel engine having a combustion chamber assembly, comprising:

a combustion chamber being defined intersecting a crown of the piston, the combustion chamber being defined by a concave surface in cooperation with three convex surfaces, adjacent surfaces having direct smooth junctures.

23. The piston of claim 22, a combustion chamber center portion, the center portion being defined at least in part by the convex sphere to define a post, the sphere having a radius and an origin, the origin of the radius lying on a combustion chamber central axis;

a combustion chamber second curved surface forming in part a bowl bottom margin and being a concave annular surface having an origin and a radius and being joined to the post;

a combustion chamber third curved surface being a convex annular surface and forming a portion of a combustion chamber side margin and providing a major part of the combustion chamber reentrancy, the third curved surface having an origin and a radius and being joined to the second curved surface; and

a combustion chamber fourth curved surface further being a convex annular bowl lip surface intersecting the crown of the piston and joined to the third curved surface.

24. The piston of claim 23 wherein the origin of the post is disposed on the combustion chamber center axis, the center axis of the combustion chamber being coaxial with the center axis of the piston.

25. The piston of claim 22 wherein the juncture between adjacent curved surfaces requires no additional surfaces to effect a smooth transition therebetween.

26. The piston of claim 22 wherein the combustion chamber is symmetrical about a combustion chamber center axis.

27. The piston of claim 23 wherein the ratio of a radius of the center portion convex spherical surface, RS1, of the combustion chamber to a maximum bowl diameter, D2, is greater than 0.11 and less than 0.48.

28. The piston of claim 27 wherein the ratio of the radius of the center portion convex spherical surface, RS1, of the combustion chamber to the maximum bowl diameter, D2, is substantially 0.314.

29. The piston of claim 23 wherein a ratio of the combustion chamber bowl diameter D2 to a piston diameter D1 is greater than 0.46 and less than 0.86.

30. The piston of claim 29 wherein the ratio of the combustion chamber bowl diameter D2 to the piston diameter D1 is preferably substantially 0.598.

31. The piston of claim 23 wherein a ratio of the diameter of the bowl lip D3 to a maximum bowl diameter D2 is greater than 0.44 and less than 0.999.

32. The piston of claim 31 wherein the ratio of the diameter of the bowl lip D3 to the piston diameter D2 is substantially 0.88.

33. The piston of claim 23 wherein the ratio of a annular surface R1 to a maximum diameter of the bowl D2 is between 0.06 and 0.36.

34. The piston of claim 33 wherein the ratio of the annular surface R1 to the maximum diameter of the bowl D2 is substantially 0.12.

35. The piston of claim 23 wherein a ratio of an annular surface R2 to a maximum diameter of the bowl D2 is between 0.06 and 0.41.

36. The piston of claim 35 wherein the ratio of the annular surface R2 to the maximum diameter of the bowl D2 is substantially 0.141.

37. The piston of claim 23 wherein a ratio of a maximum bowl depth H1 to a maximum bowl diameter D2 is between 0.24 and 0.54.

38. The piston of claim 37 wherein the ratio of the maximum bowl depth H1 to the maximum bowl diameter D2 is preferably substantially 0.308.

39. The piston of claim 23 wherein a ratio of the height of the bowl post H2 to a maximum bowl diameter D2 is between 0.13 and 0.43.

40. The piston of claim 39 wherein the ratio of the bowl post height H2 to the maximum bowl diameter D2 is preferably substantially 0.226.

41. The piston of claim 23 the combustion chamber having a central axis, the combustion chamber central axis being coincident with a piston central axis.

42. The piston of claim 22 being formed free of flat surfaces.

43. A method of forming a combustion chamber for use in a piston of a diesel engine, comprising:

defining a combustion chamber bowl intersecting a crown of the piston, defining a piston central axis, forming the combustion chamber by a concave surface in cooperation with three convex surfaces and joining adjacent curved surfaces directly to smoothly form surface junctures.

44. The method of claim 43 including:

defining a combustion chamber elevated center post at least in part by a portion of a convex sphere, the sphere having a radius and an origin,

defining a combustion chamber bottom margin in part and lower sidewall by a first annular surface, the first annular surface having a radius and smoothly joining the annular surface to the post;

defining a combustion chamber upper sidewall and major reentrancy by a second annular surface, the second annular surface having a radius and an origin and smoothly joining the first annular surface; and

defining a bowl lip by a third annular surface, the third annular surface providing a smooth transition to the crown of the piston and being smoothly joined to the second annular surface.

45. The method of claim 43 including defining smooth surface junctures between adjacent curved surfaces, without introducing any additional bowl surfaces.

46. The method of claim 43 including disposing the origin of the center post on the piston central axis.

47. The method of claim 43 including forming the combustion chamber free of flat surfaces.

48. The method of claim 43 including disposing a combustion chamber central axis coincident with the piston central axis.

49. The combustion chamber assembly of claim 2 wherein the ratio of the annular surface radius R3 to the maximum diameter of the bowl D2 is between 0.01 and 0.12.

50. The combustion chamber assembly of claim 49 wherein the ratio of the annular surface radius R3 to the maximum diameter of the bowl D2 is preferably 0.026.

51. The combustion chamber assembly of 23 wherein the ratio of the annular surface radius R3 to the maximum diameter of the bowl D2 is between 0.01 and 0.12.

52. The combustion chamber assembly of claim 51 wherein the ratio of the annular surface radius R3 to the maximum diameter of the bowl D2 is preferably 0.026.